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ABSTRACT

The Memphis Apple Classroom of Tomorrow (ACOT), one of seven ACOT locations, was a joint project of the city schools and Apple Computer. The ACOT consisted of a class of 30 fifth grade students in an inner city school, who were selected on the basis of the willingness of the students and their parents to participate and to use computers in the classroom and at home. (The Memphis class was the only ACOT class with an entirely black student population.) Each student was provided with a computer both at school and at home, and 10 high school students served as peer tutors and academic role models, communicating with ACOT students through an electronic bulletin board. Computer education was integrated into the curriculum, and the students learned to develop programs in mathematics, language arts, and social studies, as well as how to use commercially-developed software. Project evaluation included achievement testing using the California Achievement Test (CAT); surveys of student, parent, and tutor attitudes; monitoring of time-on-task; and analysis of attendance records. ACOT students had significantly higher scores on the CAT on vocabulary, reading comprehension, language mechanics, mathematics comprehension, and mathematics concept/applications than those in non-ACOT classes. ACOT students also had more positive attitudes toward the educational experience and their attitudes improved from fall to spring in the areas of self-confidence, peer relationships, goal orientation, and study habits. Parents and tutors also considered the experience positive. Data are displayed in 12 appended tables. (MES)

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EVALUATION OF THE APPLE CLASSROOM OF TOMORROW

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EVALUATION OF THE APPLE CLASSROOM OF TOMORROW PROJECT

Introduction

The Apple Classroom of Tomorrow (ACOT) was a joint project of the Memphis City Schools (MCS) and Apple Computer, Inc. The Memphis ACOT classroom site was one of seven ACOT locations in the United States.

Description of Lester ACOT

The Apple Classroom of Tomorrow consisted of a heterogeneous group of 30 fifth grade students. The classroom had 30 microcomputers to achieve a ratio of one computer per student. Each student had a CPU with a 64K RAM, a color monitor, and one disk drive. There was a teacher station with a printer and two disk drives in the room. A software library, including appropriate instructional materials was located in the room.

Computer education was integrated into existing subject areas rather than being taught as an isolated subject. Students learned to develop computer programs in the context of mathematics, language arts, or social studies and to utilize a variety of commercially developed software.

The Memphis ACOT class was unique within the total project as the only ACOT class with an entirely black student population in an inner city school. The ACOT students at Lester were selected on the basis of application and willingness of both students and their parents to participate and utilize computers in the classroom and at home.

Project personnel provided 10 hours of training to parents in the use of both the hardware and software. Each student was provided with a computer both at school and at home. Parent meetings were well attended and a survey of ACOT parent attitudes was conducted. Observations of classroom activities were made throughout the semester. Meetings and special events were also attended.

Ten modem tutors from participating Memphis City high schools were selected on the basis of teacher recommendations to serve as both peer tutors and academic role models to reinforce the learning process. Tutors were provided with computers, modems, and software to use in their homes as part of the process. Meetings of the tutors and project personnel were held periodically throughout the semester to both assess progress and to identify areas needing clarification and/or change. The use of the electronic bulletin board as a telecommunication device was effectively implemented.

Evaluation activities generally addressed the following project objectives:

1. Demonstrate the integration of the computer into the standard curriculum as a learning tool.
2. Show learner improvement in both basic skills and enrichment areas by administering pre and post achievement tests.
3. Provide additional avenues of communication among students, parents, and educators.
4. Demonstrate student enthusiasm and appreciation for learning by showing increased attendance.
5. Identify computing skills necessary for survival in a technical society.
6. Provide the opportunity for students to develop skills in telecommunications through the use of home computers and modems.

Evaluation activities included:

1. Determining the effect of the use of computers for instruction on the learning process through analysis of scores on the California Achievement Test (CAT).

2. Attitudes toward learning of ACOT fifth grade students were compared with attitudes of similar Non-ACOT fifth graders.

3. Attitude of parents of ACOT fifth grade students were summarized.

4. Monitoring throughout the 1986-87 academic year included observation of time on task.

5. Interviews and monitoring to determine the quality of tutor-tutee communications.

This report provides a general description of the activities and progress of the ACOT fifth grade class during the 1986-87 academic year. The focus of this report will be on Phase II of the implementation of ACOT into the core curriculum content areas and attitudes of participants toward the program.

Methods

Evaluation activities to assess the goals and objectives of the ACOT project included achievement testing, an inventory of student attitudes toward the learning experience, a survey of parents on attitudes toward the ACOT project, classroom observations, monitoring of student time-on-task, and a survey of modem tutors regarding the tutoring experience. Analysis of attendance records of ACOT students and the other two fifth grade classes was included as an evaluation activity.

The California Achievement Test (CAT) Form E, Level 15, was used to test fifth grade students on academic achievement. Subtests included reading vocabulary, reading comprehension, spelling, language mechanics, language expression, math computation, math concepts/applications, and study skills. In addition, total reading, total language, and total

mathematics as well as total battery were calculated. Raw scores on all subtests were used in the analyses. Multivariate analysis of variance (MANOVA) was used to determine differences in achievement on all CAT/ subtest scores between the ACOT class and two Non-ACOT fifth grade classes. MANOVA was also used to determine differences in achievement between the three classes on the total scores. Scheffe's tests were used as followup to significant tests to further determine statistical significance. Pre-post paired t-tests on fall and spring CAT scores for the ACOT students were used to determine change or academic progress.

Parent surveys were conducted by questionnaire to determine parent attitudes toward the ACOT experience. Percentage of response and summarization of comments were used to describe parent attitudes and opinions.

Attendance data for the first and second semesters were obtained and comparisons made between the ACOT and the two Non-ACOT fifth grade classes on the basis of the average number of absences. Monitoring and classroom observation summaries are also included.

Tutors completed a questionnaire related to their experience with the project. Comments of the tutors were summarized.

Results

Analysis of Student Achievement

The California Achievement Test (CAT) Form E, Level 15 was administered to all fifth grade students in May, 1987. Multivariate analysis of variance (MANOVA) was used to determine academic achievement of Lester Fifth grade students. The subtests on the CAT included reading vocabulary, reading comprehension, language mechanics, language expression, math comprehension, math concepts/applications, spelling, and study skills.

All subtests were used simultaneously as dependent variables, and the classification or grouping variable was class section. Section 03 was the designation of the ACOT class, while Sections 01 and 02 were the Non-ACOT fifth graders. Average scores on all subtests for each section are presented in Tables 1 through 3.

The MANOVA test for the hypothesis of no overall effect between classes was significant at $p = .0011$, (Wilk's criterion, $L = .5136$, $F = 2.72$). The significance level was set at $p \leq .05$. As shown in Table 4, all subtests were significant with the exception of the language expression, spelling, and study skills subtests. The subtests that were significant were as follows: reading vocabulary $F = 7.18$, $p = .0016$; reading comprehension $F = 5.39$, $p = .0069$; language mechanics $F = 3.91$, $p = .0251$; math comprehension $F = 4.01$, $p = .0231$; math concepts/applications $F = 8.24$, $p = .0007$.

Scheffe's Test was used as followup to the significant MANOVA to further examine differences between class sections on the subtests of the CAT. The results indicated that the ACOT class, as a group, scored significantly higher than both Non-ACOT sections on reading vocabulary and math concepts/applications subtests. The ACOT class (Section 03) was significantly higher than Section 01 on reading comprehension and math comprehension. The ACOT class was significantly higher than Section 02 on language mechanics. The complete results of the Scheffe's Tests are included in Table 5.

In order to compare fall achievement test results with spring results, paired t-test analyses were run on all three fifth grade classes. The t-test analyses were used for descriptive purposes only. The spring

and fall means were computed and the difference between the scores were calculated on all fifth grade students that had both scores. T-test analyses were performed on the difference scores. Results for all three classes are presented in Tables 6 through 11. The analyses were completed for reading vocabulary, reading comprehension, math comprehension, math concepts/applications, total reading and total math.

Paired t-test analyses were statistically significant at $p \leq .05$ on all subtests for all three classes with only two exceptions. Section 02 did not result in statistical significance on the subtest, reading comprehension ($t = 1.78$, $p = .0953$), or math concepts/applications ($t = 1.80$, $p = 0.0913$). However, only 16 students in Section 02 had both fall and spring scores available for analysis. Gains were made, but statistical significance was not achieved. (See Table 8.)

Analysis of Class Attendance

In order to address the objective of increased attendance of ACOT students, analysis of variance (ANOVA) of the average number of absences for each fifth grade class was performed. The average number of absences for the ACOT class (Section 03) was 6.32 days. The Non-ACOT class (Section 02) had an average of 10.09 absences, and Non-ACOT class (Section 01) had 6.04 absences. ANOVA yielded an F-Value of 1.09, $p= 0.1926$. Therefore, the differences in attendance between the three classes were not statistically significant. Complete attendance data were available for 73 students.

Modem-Tutoring/Electronic Bulletin Board

The integration of the electronic bulletin board feature of the ACOT program was accomplished in the fall semester. Ten high school students served as modem tutors for the students in the ACOT class.

Meetings between the project personnel and tutors were held periodically to monitor the process. Get-acquainted parties for the tutor and ACOT students provided the opportunity for interaction on a personal level. Students initially were reluctant to use the bulletin board, and some problems with telephone connections were encountered. It was necessary to facilitate the process with the use of incentive programs to encourage the ACOT students to use the bulletin board. The bulletin board feature was identified by project personnel as an area needing improvement. Plans for changing the process and providing more structure within the design of the tutoring process were initiated before the end of the spring semester. Increase in usage of the bulletin board by ACOT students was evident during the last half of the second semester. Student comments indicated that the students had varied reactions to the process, but as a group, viewed the tutoring feature as a valuable adjunct to the learning experience.

Tutors also responded to a questionnaire regarding the tutoring experience. Most of the respondents indicated that they found it rewarding. However, some tutors expressed some disappointment at the lack of student participation. Overall, the tutors felt that the ACOT tutoring experience was a valuable life experience.

Summary of Monitoring and Classroom Observation

Classroom observations were made by the evaluator throughout both semesters of the academic year. The format of the class usually included simultaneous teacher-directed small group activities and individual activities utilizing the computer software packages. Student interaction among those students working at the computer stations was apparent. Typi-

cally, the teacher directed the group activities in question-and-answer sessions; those students would then return to the computer and use the appropriate software package to complete exercises and practice sessions as a lesson followup.

Time-on-task varied by individuals, as would be expected. It was important to note which software package was to be utilized in a particular lesson in the ACOT class, because some students preferred some software packages over others.

Summary of Spring ACOT Parent Survey

Twenty-three of 30 parents of Lester ACOT students responded to the spring administration of the ACOT Parent Survey questionnaire yielding an 88.4% return rate. The overall results indicated very positive attitudes toward the ACOT experience.

One hundred percent of the parents responded positively to the following items:

I am happy to have had a computer in my home.

It was very easy to learn to use a computer.

I enjoyed using the computer in my home.

We had no problems keeping the computer connected to the telephone.

We had no problems with our telephone.

More than 95% agreed with the following statements:

Computers have improved the quality of life.

It is important to know how to use computers.

I am glad my child used a computer at school.

It was easy to keep a computer in my home.

My child used the bulletin board on the computer to send messages to his/her tutor.

My child used the bulletin board to send messages to his/her classmates.

Slightly more than 90% agreed with the following questionnaire items:

People who know how to use computers can get better jobs.

Using a computer made my child more self-confident.

Younger children in our family used the computer.

Older children in our family used the computer.

My child used the bulletin board on the computer to send messages to teachers.

Eighty-seven percent agreed that their child learned more by using a computer. Slightly more than 78% disagreed that their child did not learn to think as well for himself/herself by using the computers, however, about 22% were not sure. Almost 82% disagreed with the statement that "computers are just a passing fad." Parent opinions were somewhat more varied on whether or not most children learn just as well without a computer. Almost 48% agreed that children do learn as well without a computer, 24% disagreed, and 29% were not sure. Complete results are presented in Table 2.

Summary of Parent Comments

In response to a question regarding the advantage or good points of having a computer in the home, the respondents noted the advantages for learning, and in particular, learning to keyboard or type. Some parents commented on the creative aspects and the enhancement of leisure time. They also noted that the students were more likely to stay home to use

the computer in the evening or weekends. Other comments were related to advantages to other children and family members, as well as future benefits in having knowledge of computers.

Summary and Conclusions

The evaluation of Phase II of the ACOT project was focused on a description of the implementation of the computer into the standard curriculum of the Lester fifth grade ACOT class. Evaluation activities included description and analyses of student achievement scores by comparing the ACOT class with two other similar fifth grade classes at Lester Demonstration School. Student attitudes toward the fifth grade learning experience were also compared between classes. Parent attitudes were summarized and attitudes of participating high school modem school tutors toward the tutoring experience were examined. Observation and monitoring were on-going throughout the academic year. Student attendance (absences) were also reported.

Achievement test results, based on spring and fall scores were reported. Multivariate analysis of variance (MANOVA) showed that there were statistically significant differences between classes on the subtests of the CAT. The ACOT class, as a group, scored higher than both Non-ACOT section on reading vocabulary and math/concepts applications. The ACOT class scored higher than Section 01 on reading and math comprehension, and higher than Section 02 on language mechanics. There were no significant differences between Sections 01 and 02.

All three fifth grade classes made significant gains on the CAT from fall to spring. However, the results for Section 02 were not significantly different for reading comprehension and math concepts/applications.

The small number of students (N=16) may have accounted for this result. The ACOT class means on all subtests were higher than the other two sections, but only those reported above were statistically significant.

Attendance, or absence rates of students in the fifth grade at Lester, did not show statistically significant differences between classes. The ACOT class had an average of 6.30 absences and Section 01 had 6.04. Section 02 had 10.09 average number of absences. Attendance rates did not appear to be related to the ACOT experience. However, having a computer at home could have had a reverse effect on class attendance.

Observations and monitoring throughout the year indicated a high level of interest and class participation in activities. All students appeared to like using the computer in the classroom. Student interaction appeared to indicate a spirit of cooperation in the class setting.

Parents of ACOT students were surveyed and their attitudes were very positive toward the ACOT experience. One hundred percent of the respondents indicated that they were happy to have had a computer in the home, enjoyed using it, found it easy to learn, and did not experience problems. More than 90% indicated that the experience was positive for their ACOT student as well as other family members. Parent opinions were more varied on whether or not children learn just as well without a computer. Forty-eight percent agreed that they do learn as well. Parents also noted that their ACOT student was more likely to stay home after school to use the computer. The high school modem tutors generally considered the tutoring experience as positive.

The results of the evaluation were positive in relation to the following objectives:

1. To demonstrate the integration of the computer into the standard curriculum as a learning tool.

2. To show learner improvement in both basic skills and enrichment areas by administering pre and post achievement tests.

3. To provide effective avenues of communication among students, parents, and educators.

4. To identify computing skills necessary for survival in a technical society.

5. To provide the opportunity for students to develop skills in communications through the use of home computers and modems.

Although the results did not show increased attendance, the analysis of attitudes did indicate increased student enthusiasm and appreciation for learning.

Recommendations

Based on the results of the evaluation of Phase II of the ACOT Project, the following recommendations were made:

1. Develop specific achievement objectives based on the findings of the analyses, e.g. related to language skills, spelling skills, and study skills. Include additional achievement variables related to science and social studies.

2. Incorporate learning styles as a variable to determine if learning style preference influences achievement or attitudes toward the use of computers in the educational experience.

3. Revise the plan for the tutoring experience to provide more structure for the modem tutors and the ACOT students.

Table 1

California Achievement Test Means
Spring 1987
Non-ACOT Section 01

Variable	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Standard Error of Mean
Reading Vocabulary	18	29.00	9.85	10	42	2.32
Reading Comprehension	18	32.50	10.33	18	48	2.43
Reading Total	18	61.50	19.71	29	87	4.65
Language Mechanics	16	21.38	5.57	12	30	1.39
Language Expression	17	32.71	10.05	14	44	2.44
Language Total	16	53.94	13.97	26	74	3.49
Math Comprehension	18	33.33	7.77	18	47	1.83
Math Applications	18	29.17	7.68	15	43	1.81
Math Total	18	62.50	13.12	47	88	3.09
Battery Total	16	175.13	39.25	105	237	9.81
Spelling	16	23.00	6.47	8	31	1.62
Study Skills	17	14.88	4.43	6	20	1.07

Table 2

California Achievement Test Means
Spring 1987
Non-ACOT Section 02

Variable	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Standard Error of Mean
Reading Vocabulary	20	29.00	8.40	16	48	1.88
Reading Comprehension	20	27.45	10.15	11	51	2.27
Reading Total	20	56.45	17.08	35	91	3.82
Language Mechanics	20	20.50	5.64	9	31	1.26
Language Expression	20	31.40	8.84	18	44	1.98
Language Total	20	51.90	13.05	33	73	2.92
Math Comprehension	20	36.55	5.78	24	44	1.29
Math Applications	20	31.05	7.52	18	47	1.68
Math Total	20	67.60	12.07	45	90	2.70
Battery Total	20	175.95	37.95	116	254	8.49
Spelling	20	25.60	3.42	17	30	0.77
Study Skills	20	13.60	5.47	3	23	1.22

Table 3

California Achievement Test Means
Spring 1987
ACOT Section 03

Variable	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Standard Error of Mean
Reading Vocabulary	30	36.13	8.97	22	51	1.64
Reading Comprehension	30	36.50	11.55	13	55	2.11
Reading Total	30	72.63	19.18	35	104	3.50
Language Mechanics	29	24.48	4.73	16	33	0.88
Language Expression	29	37.72	10.27	15	52	1.91
Language Total	29	62.21	13.10	34	82	2.43
Math Comprehension	30	39.67	7.26	15	47	1.32
Math Applications	30	36.80	5.50	23	47	1.00
Math Total	30	76.47	10.50	49	90	1.92
Battery Total	29	212.59	37.74	124	274	7.01
Spelling	29	26.41	5.26	13	33	0.98
Study Skills	29	15.55	4.65	6	22	0.86

Table 4

MANOVA
Fifth Grade Lester
California Achievement Test

Manova Test for the hypothesis of no overall effect between class sections.

Wilk's Criterion L = 0.5136 F = 2.72 p = .0011*

Dependent Variable	df	F-Value	p
Reading Vocabulary	2/62	7.18	.0016*
Reading Comprehension	2/62	5.39	.0069*
Language Mechanics	2/62	3.91	.0251*
Language Expression	2/62	2.84	.0662
Math Comprehension	2/62	4.01	.0231*
Math Concepts/Applications	2/62	8.24	.0007*
Spelling	2/62	2.33	.1054
Study Skills	2/62	0.96	.3903

*Statistically significant at $p \leq .05$.

Table 5

Scheffe's Tests
Followup to Significant MANOVA
Spring 1987

Comparisons Significant at the 0.05 Level are Indicated by ***

SECTION COMPARISON	SIMULTANEOUS LOWER CONFIDENCE LIMIT	DIFFERENCE BETWEEN MEANS	SIMULTANEOUS UPPER CONFIDENCE LIMIT	
Reading Vocabulary				
*03 - 02	1.198	7.621	14.044	***
*03 - 01	2.177	9.058	15.940	***
02 - 03*	-14.044	-7.621	-1.198	***
02 - 01	-5.974	1.438	8.849	
01 - 03	-15.940	-9.058	-2.177	***
01 - 02	-8.849	-1.438	5.974	
Reading Comprehension				
*03 - 01	-2.288	5.935	14.159	
*03 - 02	2.185	9.860	17.536	***
01 - 03*	-14.159	-5.935	2.288	
01 - 02	-4.932	3.925	12.782	
02 - 03	-17.536	-9.860	-2.185	***
02 - 01	-12.782	-3.925	4.932	
Language Mechanics				
*03 - 01	-0.980	3.108	7.195	
*03 - 02	0.168	3.983	7.798	***
01 - 03*	-7.195	-3.108	0.980	
01 - 02	-3.527	0.875	5.277	
02 - 03*	-7.798	-3.983	-0.168	***
02 - 01	-5.277	-0.875	3.527	

Table 5 (Continued)

Scheffe's Tests
Followup to Significant MANOVA
Spring 1987

Comparisons Significant at the 0.05 Level are Indicated by ***

SECTION COMPARISON	SIMULTANEOUS LOWER CONFIDENCE LIMIT	DIFFERENCE BETWEEN MEANS	SIMULTANEOUS UPPER CONFIDENCE LIMIT	
Language Expression				
*03 - 01	-2.553	5.162	12.876	
*03 - 02	-0.876	6.324	13.525	
01 - 03*	-12.876	-5.162	2.553	
01 - 02	-7.146	1.163	9.471	
02 - 03*	-13.525	-6.324	0.876	
02 - 01	-9.471	-1.163	7.146	
Math Comprehension				
*03 - 02	-2.212	3.002	8.216	
*03 - 01	0.653	6.239	11.826	***
02 - 03*	-8.216	-3.002	2.212	
02 - 01	-2.779	3.237	9.254	
01 - 03*	-11.826	-6.239	-0.653	***
01 - 02	-9.254	-3.237	2.779	
Math Concepts/Applications				
*03 - 02	0.835	5.847	10.859	***
*03 - 01	2.589	7.959	13.329	***
02 - 03*	-10.859	-5.847	-0.835	***
02 - 01	-3.671	2.112	7.896	
01 - 03*	-13.329	-7.959	-2.589	***
01 - 02	-7.896	-2.112	3.671	

Table 5 (Continued)

Scheffe's Tests
Followup to Significant MANOVA
Spring 1987

Comparisons Significant at the 0.05 Level are Indicated by ***

SECTION COMPARISON	SIMULTANEOUS LOWER CONFIDENCE LIMIT	DIFFERENCE BETWEEN MEANS	SIMULTANEOUS UPPER CONFIDENCE LIMIT
	Spelling		
*03 - 02	-2.919	0.814	4.547
*03 - 01	-0.586	3.414	7.414
02 - 03*	-4.547	-0.814	2.919
02 - 01	-1.708	2.600	6.908
01 - 03*	-7.414	-3.414	0.586
01 - 02	-6.908	-2.600	1.708
	Study Skills		
*03 - 01	-2.876	0.927	4.730
*03 - 02	-1.598	1.952	5.501
01 - 03*	-4.730	-0.927	2.876
01 - 02	-3.071	1.025	5.121
02 - 03*	-5.501	-1.952	1.598
02 - 01	-5.121	-1.025	3.071

ALPHA = 0.05 CONFIDENCE = 0.95 DF = 62 MSE = 27.387
CRITICAL VALUE OF F = 3.14526

*Section 03 is the ACOT class.

Table 6

Paired T-Test Analysis
Difference Between Fall and Spring Means
Non-ACOT Class - Section 01

N=21

Variable	Diff Mean	t	P
Reading Vocabulary	5.95	4.38	0.0003*
Reading Comprehension	10.19	5.97	0.0001*
Math Comprehension	11.52	6.18	0.0001*
Math Concepts/Application	5.81	3.09	0.0057*
Total Reading	16.14	5.88	0.0001*
Total Math	17.33	5.79	0.0001*

*Statistically significant at $p \leq .05$.

Table 7

Comparison of Fall and Spring
CAT Scores 1986-87
Non-ACOT Class - Section 01

Variable	Fall Mean	Spring Mean
Reading Vocabulary	23.85	30.30
Reading Comprehension	23.77	34.26
Math Comprehension	22.81	34.00
Math Concepts/Application	24.31	29.00
Total Reading	47.62	64.57
Total Math	47.12	63.00

Table 8

Paired T-Test Analysis
Difference Between Fall and Spring Means
Non-ACOT Class - Section 02

N=16

Variable	Diff Mean	t	P
Reading Vocabulary	4.44	2.15	0.0484*
Reading Comprehension	3.13	1.78	0.0953
Math Comprehension	9.44	5.68	0.0001*
Math Concepts/Application	2.38	1.80	0.0913
Total Reading	7.56	2.73	0.0156*
Total Math	11.81	6.53	0.0001*

*Statistically significant at $p \leq .05$.

Table 9

Comparison of Fall and Spring
CAT Scores 1986-87
ACOT Class - Section 02

Variable	Fall Mean	Spring Mean
Reading Vocabulary	25.00	29.90
Reading Comprehension	21.57	27.43
Math Comprehension	24.29	35.81
Math Concepts/Application	27.71	30.48
Total Reading	46.57	57.33
Total Math	52.00	66.29

Table 10

Paired T-Test Analysis
Difference Between Fall and Spring Means
ACOT Class - Section 03

N=23

Variable	Diff Mean	t	P
Reading Vocabulary	5.04	4.18	0.0004*
Reading Comprehension	6.48	4.16	0.0004*
Math Comprehension	9.78	10.66	0.0001*
Math Concepts/Application	6.61	8.68	0.0001*
Total Reading	11.52	5.28	0.0001*
Total Math	16.39	15.99	0.0001*

*Statistically significant at $p \leq .05$.

Table 11

Comparison of Fall and Spring
CAT Scores 1986-87
ACOT Class - Section 03

N=27

Variable	Fall Mean	Spring Mean
Reading Vocabulary	29.62	35.89
Reading Comprehension	29.07	35.04
Math Comprehension	31.62	39.44
Math Concepts/Application	30.79	37.00
Total Reading	58.69	70.93
Total Math	62.41	76.44

Table 12

Lester ACOT Parent Survey - Spring 1987
Percentage of Response N=23

	Items	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1.	Computers have improved the quality of life.	82.6	13.0	0.0	4.3	0.0
2.	Computers are just a passing fad.	4.5	13.6	0.0	36.4	45.5
3.	People who know how to use computers can get better jobs.	73.9	17.4	8.7	0.0	0.0
4.	It is important to know how to use computers.	65.2	30.4	4.3	0.0	0.0
5.	I am glad my child used a computer at school.	87.0	8.7	0.0	0.0	4.3
6.	I am happy to have had a computer in my home.	82.6	17.4	0.0	0.0	0.0
7.	It seems that my child spent too much time on the computer.	8.7	0.0	13.0	52.2	26.1
8.	It was easy to learn to use a computer.	47.8	52.2	0.0	0.0	0.0
9.	I enjoyed using the computer in my home.	65.2	34.8	0.0	0.0	0.0
10.	Using a computer made my child more self-confident.	56.5	34.8	4.3	4.3	0.0
11.	My child learned more by using a computer.	78.3	8.7	4.3	4.3	4.3
12.	My child did not learn to think as well for him/herself by using the computers.	4.3	0.0	21.7	47.8	26.1
13.	Most children learn just as well without a computer.	14.3	33.3	28.6	23.8	0.0
14.	It was easy to keep a computer in our home.	60.9	34.8	0.0	4.3	0.0

Table 12 (Continued)

Lester ACOT Parent Survey - Spring 1987
Percentage of Response N=23

Items	Yes	No	Don't Know Does Not Apply
15. Younger children in our family used the computer.	56.5	34.8	8.7
16. Older children in our family used the computer.	73.9	17.4	8.7
17. We had no problems keeping the computer connected to the telephone.	40.9	59.1	0.0
18. We had no problems with our telephone.	36.4	63.6	0.0
19. My child used the bulletin board on the computer to send messages to his/her tutor.	85.7	9.5	4.8
20. My child used the bulletin board on the computer to send messages to the teachers.	85.7	4.8	9.5
21. My child used the bulletin board on the computer to send messages to his/her classmates.	81.0	14.3	4.8